Comparative benefits and optimal use of Environmental Taxes

2

Comparative benefits and optimal use of environmental taxes

BY
MICHAEL FAURE† AND STEFAN UBACHS††

1. INTRODUCTION

The economic argument in favor of environmental taxation is well-known. Ever since the early work of Pigou, economists have stressed the importance of taxation as an instrument to control externalities. Ever since this first step, a whole body of economic literature has developed on how to shape optimal environmental taxes. Some have even taken this argument a step further by arguing in favor of the feasibility of ecological taxation, pleading in favor of an ecological reshaping of the entire taxation system.

There seems to be, however, still a sharp contrast between on the one hand the enthusiasm of economists for environmental taxes and on the other hand empirical realities. Looking at the empirical evidence, there seem to be notable differences between Europe, where some positive experiences with environmental taxes exist, and the US. The literature indicates that charges are rarely introduced in the textbook form and that emission charges or fees seem to be more used as a revenue generating device for public services rather than as instruments of environmental policy as they were prescribed by economists.

Most empirical evidence concerning the effectiveness of environmental taxes and charges therefore comes from Europe. There are some success stories from countries like the Netherlands and Germany indicating that, e.g. water effluent charges have led to significant increases in water treatment, leading many firms to comply with emission standards.

The question of course arises, and this is particularly what we are going to address in this paper, what the reasons could be for the seeming divergence between the economist pleading in favor of environmental taxes on the one hand and the still relatively rare use of environmental taxes in practice, especially in the US. We will first analyze whether these divergences may be explained on public interest grounds. In this respect, it is important to stress that environmental taxes are almost never the sole instrument of environmental policy chosen. Usually, they constitute a part of a command and control regulatory mix, whereby criminal and administrative sanctions

† Michael Faure studied law at the University of Antwerp and criminology at the University of Ghent. He is currently professor of comparative and international environmental law at Maastricht University, academic director of the Maastricht European Institute of Transnational Legal Research (METRO).

†† Stefan Ubachs is a tax advisor at Loyens & Loeff, Eindhoven, the Netherlands, and researcher at the Metro Institute, Maastricht University. He is writing a doctoral thesis on environmental taxation in the Netherlands. This contribution is based on the personal opinion of the authors and does not represent the opinion of Loyens & Loeff.

still apply to back up regulatory standards. Moreover, voluntary instruments and liability rules are also used. There may be particular reasons why, from a public interest perspective, some governments choose not to use environmental taxes. Some scholars like Frey have argued that environmental taxes may lead to a "crowding out" effect, meaning that by paying the tax, industry would be less inclined to engage actively in environmental policy. Governments may wish to choose the type of instruments which have less of the crowding out effects.

However, it is also well possible that the choice of particular environmental instruments is influenced by the role of private interest groups lobbying with the government. Public choice scholars such as Hahn have shown why emission taxes are seldom used, for example in the US, and have also analyzed why policy still relies to a large extent on the command and control approach. They argue, following the model of Buchanan and Tullock that standards can be used as barriers to entry to new firms, thus raising the profits of existing firms. Charges on the other hand do not preclude entry by new firms and represent an additional cost to the existing firms on the market. This basic point made by Buchanan and Tullock has been extended by other scholars, examining the implication of rent seeking for pollution taxation. Moreover, through grand-fathering the rights of existing firms on the market are often protected.

Hahn also argues that the varying interest groups' attitudes in, for example, the US and Europe may account for the fact that European countries tend to rely more on the use of fees, whereas marketable permits have been introduced at a relatively important scale in the US. If this were true, the selection of an appropriate mix of policy instruments will to a large extent be determined by the way political choices are actually made in different countries.

These are some of the issues which we would like to address in this paper. It is set up as follows: first we start with a summary of the basic economic argument in favor of environmental taxation (§ 2); then we address the empirical evidence as presented in the literature concerning the effectiveness of environmental taxes in Europe and the US (§ 3). This will lead us to defining that more particularly in the US environmental taxes are seldom introduced and never in the text book form. This then brings about the second question whether the failure to introduce environmental taxes according to economic prescriptions may be explained on public interest grounds or should be seen as the result of rent seeking by interest groups (§ 4). The public interest analysis will address the role of taxes compared to other environmental instruments and will address the crowding out effects as analyzed by Frey. Finally, the public choice theory will be used to explain why to some extent efficient environmental taxes may not be introduced.

Hence, the public interest and private interest explanations for the use of environmental taxes will be weighed, using economic analysis of law and public choice theory. Thus the paper allows us to provide some insights in the institutional conditions that should be met (if one wishes to draw normative implications from our analysis) in order to guarantee an effective introduction and use of environmental taxes.

We end with a few concluding remarks in § 5.

2. TAXES VERSUS OTHER INSTRUMENTS: THEORY

The past few years, policy makers in the Netherlands as well as in foreign countries have used many instruments to create an environmental policy that makes environmental hazards controllable. Instruments that have been used vary from regulation to the use of free market principles. Between these extremes a wide range of instruments exists that on the one hand do not rely completely on the functioning of the free market, but on the other hand nevertheless make use of economic processes to realize a reduction of environmental hazards. One of these instruments is environmental taxation; by introducing an environmental tax one can try to raise the price of goods that are harmful to the environment, in order to decrease the demand for those goods. If the demand for harmful goods decreases, so will the environmental hazards caused by these goods.

In this section, we will discuss briefly the theoretical functioning of three instruments of environmental policy, namely regulation, tradable permits and the use of taxes.

2.1 Regulation

An instrument that is used traditionally when creating an environmental policy, is regulation. For instance, the government may set a certain emission standard for industry of for example X megaton CO_2 per year. If a factory emits above this level, a sanction will be imposed; in most cases, this will be an administrative sanction, but in serious cases one can also think of a criminal penalty.

In designing such regulations, several problems arise. Firstly, the authorities have to be able to set emission standards that are suitable to reach the environmental target (for example the reduction of CO_2 to a certain level). In setting this standard a cost benefit analysis can be applied. Once the environmental target is set, the maximum emission per factory can be set. The sum of the emission standards for all factories will be appropriate in realising the environmental target that has been set.

In theory, this standard equals the optimal, i.e. the economic efficient pollution. In practice, however, the standard that is set will not equal the optimal pollution, but will merely be the result of a politically acceptable decision. When setting this standard, interest groups such as industry, will try to lobby for a standard that is as low as possible, since the legislator is not involved prescribing the standard, but delegates the process of setting such standards to specialised agencies, intense lobbying activities take place often at the level of these agencies.[1] If this lobbying leads to a standard that is too low, the desired environmental target (reduction of CO_2 emission with quantity X) cannot be reached completely.

An important condition for the successful use of such regulation, is that the authorities should be able to enforce their regulations. In many cases, polluters will balance the possibility of being fined against the marginal profit that can be realized with additional pollution.[2] However, these enforcement costs can be considerable. If the control is too strict, enforcement costs are too high. On the other hand, if the level

1 The behavior of such agencies has been investigated by Downing, P.B., "A Political Economy Model of Implementing Pollution Laws", *Journal of Environmental Economics and Management*, Vol. 8, 1989, 255-271.

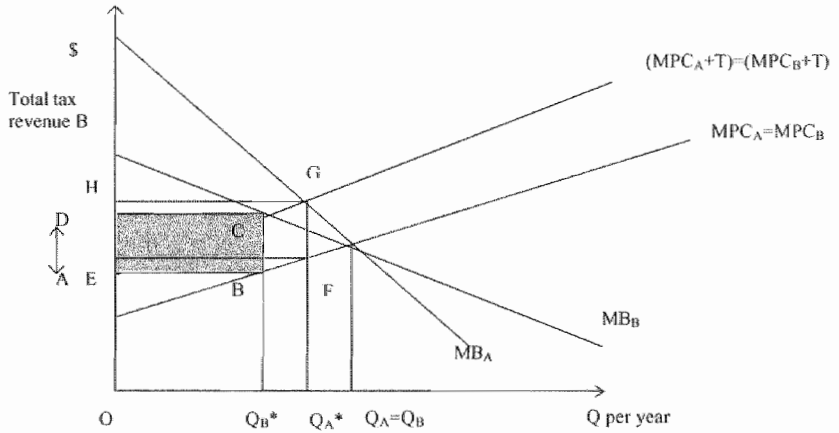
2 This effect will be limited if polluters consider it immoral to pollute more than the emission standard allows.

of control is too low, the damage costs for the environment will be too high.[3] If the amount of pollution cannot be measured at all, the introduction of regulation is questionable.

Another problem is that the authorities will in many cases not be able to determine what the efficient emission levels for each polluter is; indeed, the efficient pollution level will vary from case to case. The authorities should be able to identify the polluters and also to determine the efficient pollution for that specific polluter. For certain factories the efficient pollution level will probably be higher than the imposed standard, for other factories it will be higher. Polluters will in most cases show strategic behavior and therefore exaggerate their need for pollution rights. If the authorities are not able to require the correct information about the actual pollution of certain polluters, they might demand that all polluters reduce their emissions of for instance CO_2 by the same percentage. This will, however, inevitably lead to economic inefficiency and thus to a loss of welfare, because the possibilities for abatement of the pollution will be different for each polluter.[4]

The inefficiency caused by regulation can be illustrated in Figure 1.

Figure 1



Firms A and B both produce paper. MBa is the marginal benefits curve of firm A, MBb is the marginal benefits curve of firm B. The marginal private costs curves of firms A and B are equal, therefore MPCa = MPCb.[5] The profit maximizing output will be equal for both firms, therefore Qa = Qb. If the marginal damage caused by the polluters equals T, both firms should produce until their marginal benefit equals their marginal cost plus marginal damage T. This efficient output is Q*a for factory A and Q*b for factory B. This means that the optimal pollution will only be realized if factory A reduces its output with a higher amount than factory B, although both factories initially produce the same quantity.

3 Tietenberg, T., *Environmental and Natural Resource Economics*, Reading, Addison-Wesley, 2000.
4 See H.S. Rosen, *Public Finance*, Chicago, Irwin, 1999.
5 In reality the marginal private cost curves will of course be different.

Since the authorities usually do not know the marginal benefit or marginal cost curves of polluting firms, they will most likely require polluters that produce the same quantity of goods to reduce their output equally. If both factories would be required to reduce their output to point Y*, factory A would have to reduce pollution less than the efficient output in point Q*a. Factory B on the other hand, would have to reduce its output more than its efficient output in point Q*b.

Factories that have the possibility to abate pollution with a higher percentage than is required by the imposed standard, do not have any (financial) incentive to do so,[6] because they do not receive financial compensation for reducing their pollution. On the other hand, factories that only have limited possibilities to reduce pollution, will still be forced to do so, at great cost.

If trading pollution rights would be allowed, the first factory would consider reducing its pollution further (beyond its granted pollution rights), because it would have the possibility to sell the remaining rights. In that case, innovation and introduction of cleaner technology by the first factory would be stimulated. The second factory could buy these rights, and would thus have to deal with a limited reduction of pollution.

If the factory that pollutes less than the imposed standard would be able to sell its "outstanding pollution rights" to a factory that prefers to pollute more than the imposed standard, the loss of welfare compared to a situation in which selling is not allowed, could be decreased.

2.2 Tradable permits

The problem just mentioned could be solved by using tradable permits as a policy instrument. This instrument was introduced in the 1960s by Dales[7] and has become increasingly popular, especially in the United States.[8]

Under this system, tradable permits that for instance allow to emit a certain quantity of CO_2 during a certain period are issued to factories. Again the authorities will have to set a certain environmental target, for instance the limitation of carbon dioxide emissions to quantity X. The government will subsequently issue permits until quantity X is reached. The issuing of these permits takes place according to a certain distribution formula. Many different distribution schemes are possible; if the permits are issued for free, companies that pollute less than is allowed by their permit, can sell their remaining quota to companies that wish to pollute more than their assigned quota. If government chooses to auction the permits, factories simply buy units of pollution at the equilibrium price, depending on their total amount of pollution.

According to the Coase Theorem, polluters have mutual interest in trading permits: a polluter who pollutes less will have the possibility of receiving money by trading his remaining pollution rights, while the polluter who would like to pollute more, is willing to pay for extra pollution rights.[9]

6 Of course there always can be a moral incentive to reduce pollution, even if such a reduction is not required by law.

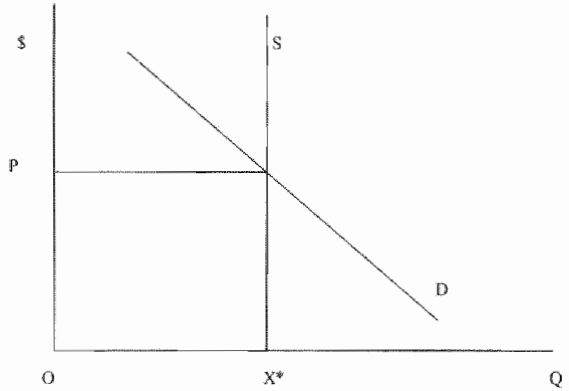
7 Dales, J., *Pollution, Property and Prices: An Essay in Policy*, Toronto, University of Toronto Press, 1968.

8 One can think of the National Sulfur Dioxide Trading Program and Regional NOx Trading Programs; see Nash, R.N. and Revesz, R.L., "The design of Marketable Permit Schemes to Control Local and Regional Pollutants", www.cserge.ucl.ac.uk/Nash_and_Revesz.pdf

9 Provided that transaction costs are low.

This way, a possible loss of welfare – which arises if regulation is used as instrument for environmental policy – can be reduced. If the government introduces such a system in which permits are sold to the polluters, the government acts like a broker and should in any case be able to control the functioning of the system. The functioning of a market of tradable permits is illustrated in Figure 2.

Figure 2



Suppose the government intends to limit the carbon dioxide emissions by a certain industry to quantity X* per year. To reach this environmental target, government auctions off pollution rights. Supply curve S shows the amount of pollution permits the government is willing to sell to polluters; because the total supply is fixed at quantity X*, curve S is vertical. Demand curve D shows the demand of polluters for pollution rights. The intersection of curves S and D shows the equilibrium price for one unit of pollution. Firms can buy permits at the equilibrium price; those firms that are not willing to pay that price will have to reduce their output (or use technology that is friendly to the environment, to reduce carbon dioxide emission).

An important advantage of a system of tradable permits, is that polluters have to reveal their willingness to pay for pollution rights, while in a system of command and control they will not reveal their willingness to pay. In a system of command and control polluters will in many cases even try to mislead the authorities as far as their willingness to pay for pollution rights is concerned, in order to create a favorable system of regulation.

An important disadvantage of a system of tradable permits is, however, that these permits, according to some authors, have a negative influence on the moral behavior of polluters. In fact, polluters are able to buy off their unwanted behavior: it is questionable if it is desirable for such an opportunity to be offered.[10]

One should also note that a system of tradable permits only functions if emissions without permits are forbidden, and that this prohibition is actually enforced. If not, polluters are likely to emit anyway and not "waste" their money on permits.

10 See Frey, B.S., "Morality and rationality in environmental policy", *Journal of Consumer Policy*, Vol. 22, 1999, 395-417 and Frey, B.S., *Not just for the money. An economic theory of personal motivation*, Cheltenham, Edward Elgar, 1997, 56-79.

Moreover, if the government would initially distribute the permits according to a certain distribution formula, one could argue if this is desirable on grounds of distribution of wealth. This way, polluters receive free permits, which they – if they wish – can sell to other polluters. From the point of view of economic efficiency it does not matter how permits are distributed amongst polluters: it is even possible that the government grants all pollution rights to one single polluter. The functioning of the free market will automatically create a situation, which is efficient from an economic point of view.

If the permits are issued for free, the functioning of the market for pollution rights will be identical to the market that is shown in Figure 2. The supply of permits will still be fixed at quantity X*, and the supply curve will still be vertical. The equilibrium price will therefore again be reached in P.

From the point of view of distribution of income this situation is, of course, very different from the situation in which permits are auctioned: the polluters who receive the permits will have the opportunity to sell them, and thus receive proceeds. Most likely, it will be considered unfair if one polluter is granted all pollution rights and subsequently takes advantage of the opportunity to enjoy the proceeds.

2.3 Taxes

The introduction of taxes makes it possible to overcome the two remaining difficulties that arise from a system of tradable permits.

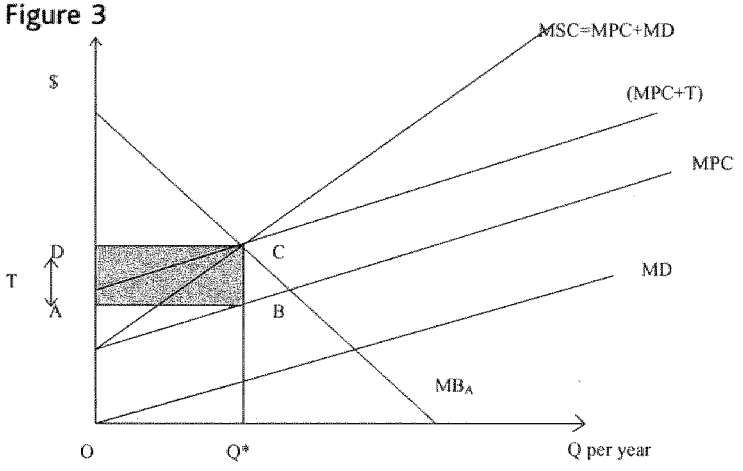
In the 1930s the English economist A.C. Pigou suggested that the negative external effects should be internalised by levying a tax on the polluter. The tax rate should be at such a level, that the social costs of the pollution are internalized in the goods that are produced by the polluter. This is illustrated in Figure 3. Not only does one have to take the marginal private costs (MPC) to the producer into account, but also the marginal damage (MD) that is caused by the production. In other words: the marginal costs of a certain good should equal the marginal social costs (MSC). In turn, marginal social costs should equal the marginal private costs of the producer, added to the marginal damage that is caused by the product, which leads to MSC = MPC + MD.

To determine the tax rate, marginal social costs should equal marginal benefits (MB), which leads to MSC = MB. Where marginal costs equal marginal benefits, economic efficiency is reached. Subsequently, the tax rate is equal to the marginal damage that is caused in MSC = MB. T illustrates the tax rate per product, so rectangle ABCD equals the total tax revenue at quantity Q*.

The problem is, of course, how to determine this optimal tax. To define the optimal tax rate, authorities will have to know both marginal damage and marginal benefits at (MPC + MD) = MB. Usually, the authorities will not have the necessary information to define the optimal tax rate. Due to this information, these ideal Pigouvian taxes are seldom seen in practice.[11] Setting the optimal tax rate does not differ from setting the optimal standard as far as regulation is concerned. Some authors have argued that environmental taxes always should have a linear tax rate, even if the MD curve is

11 Baumol, W.J. and Oates, W.E., "The Use of Standards and Prices for Protection of the Environment", *Swedish Journal of Economics*, 1971, Vol. 73, 43-44, and Barthold, T.A., "Issues in the Design of Environmental Excise Taxes", *Journal of Economic Perspectives*, 1994, Vol. 8, 133.

Figure 3



nonlinear.[12] Others have argued that a nonlinear tax rate is possible as well, as long as the actual tax schedule is made known to the polluter. The polluter will then be able to compute the amount of tax it has to pay, and can make the decision as to whether to pay the tax or to reduce pollution.[13]

If the authorities are not be able to get the required information to define the optimal tax rate, they will have to set the tax rate according to a "trial and error" method. If the actual emission cannot be measured, it will not be possible to levy a tax on the emission. In that case, the tax may be levied on the output if the output is correlated with the actual emission.

2.4 Regulation, tradable permits and taxes compared

Regulation, tradable permits and taxes do not differ in their impact as far as the setting of an environmental target is concerned. In all cases, government has to set an environmental target that will have to be reached. The way this target is reached, however, differs substantially between the three systems. Regulation does not make use of economic processes, while both a system of tradable permits and a system of environmental taxation are based on economic solutions.

An important difference between a tradable permits regime and an environmental taxation regime that the former allows trading of pollution rights, while the latter does not allow the trading of pollution rights. In a command a control system, trading of rights is also not allowed. If trading is allowed, polluters have to be prepared to pay for discharging/emitting a certain level of pollutants into the environment.

From a moral point of view, a system of tradable permits may have a negative influence on the behavior of polluters, as it gives the impression that it is possible to buy off the undesirable behavior. This impression is less likely to arise if pollution is

12 See Weitzman, M.L., "Prices vs. Quantities", *Review of Economic Studies*, 1974, Vol. 41, 477-491.
13 See Kaplow, L. and Shavell, S., "On the Superiority of Corrective Taxes to Quantity Regulation".

taxed, provided that the tax is designed as a regulatory tax, that is intended to reduce undesirable behavior. If the tax is designed as a budgetary tax, it will not be different from the income tax or value-added tax, and therefore not give the signal to the polluters that their polluting activities are undesirable. Nevertheless, there appears to be a tendency towards the so-called "greening taxation" movement, which advocates that taxes like the labor and income taxes should be replaced by environmental taxes. In that case, environmental taxation usually has a primarily budgetary character, in order not to diminish the total tax revenues. One can think of the greening of taxation that recently took place in the Netherlands; the tax rate in the personal income tax was reduced substantially (from 50% to 42% in the second tax bracket and from 60% to 52% in the third tax bracket), while environmental taxes were increased.

The choice between regulation, tradable permits or environmental taxes will in many cases also depend on the number of polluters. If there is only one polluter and both marginal harm and marginal benefit are known to the authorities, regulation will most likely the best solution for attaining the government's environmental target. If there are few polluters, it will be more difficult to determine the marginal benefit for each polluter. In that case, a system of tradable permits is likely to be the best solution. However, if there are many polluters, it will in most cases be impossible to create a well-functioning market for tradable permits. In that case, environmental taxation will be the best solution.

3. TAXES VERSUS OTHER INSTRUMENTS: PRACTICE

The central question in this paper is, what form of legal policy instrument provides the ideal setting for "pricing" of environmental pollution? This is the most important question in the search for the optimal instrument for providing incentives to a potential polluter to prevent environmental harm. Indeed, the issues of cost benefit analysis and environmental standard setting provide indications of the extent to which the pollution should be internalized; they however do not explain what the appropriate instrument is for implementing these optimal standards.

In addressing pollution problems traditionally, there were three altrenatives. The first was the use of a system of taxes, levies or charges, which will give the potential polluter an incentive to reduce environmental harm. Second, it is possible to use the liability system, assuming that the potential polluter will be deterred by the foresight of having to pay compensation to a victim for the environmental harm he caused. Third, it is possible to fix pollution standards (notably emission standards) *ex ante* in regulation and more specifically in environmental licenses. Now, in addition to these, a whole new set of policy instruments has been developed. Economists increasingly advocate the use of market-oriented policy instruments, such as systems of emission trading and marketable permits. In addition attention is given to voluntary compliance mechanisms, such as environmental agreements.

It was obviously not possible to discuss this whole set of possible environmental policy instruments within the scope of this paper.[14] In this paper we briefly discussed

14 An excellent overview of these instruments is presented by Gunningham, N. and Grabosky, P., *Smart Regulation, Designing Environmental Policy*, Oxford, Clarendon Press, 1998.

the literature concerning two types of instruments, which have traditionally been very popular with economists, probably because they best represent the idea of "pricing" of environmental pollution. It concerns marketable permits (B) and taxes (C). After having discussed the theoretical differences between both approaches in the previous section we will now look at the differences in practice, as this is discussed in the literature, mainly based on empirical evidence.

3.2 Tradable permits

The starting point for most of the literature on tradable systems is the pioneering work of Dales.[15] Dales proposed that a market of tradable permits would be organized by the government whereby pollution rights that should be tradable would be granted for a certain period. The government would act as broker for the trade and would monitor the system. Building on Dales' proposal other authors formulated more specific proposals with respect to the shape of this market pollution rights. Montgomery[16] suggested that the pollution right should also indicate which part of the concentration of a specific compound in a particular environmental component could be emitted from a particular source. Further proposals concerning the implementation of such a model have been formulated by Ackerman et al.,[17] Rose-Ackerman,[18] Noll[19] and Tietenberg.[20] Hahn and Hester[21] drew attention to the importance of monitoring and enforcement in the framework of a market for pollution rights.

In addition to these papers sketching the theoretical benefits and the possible legal framework of a market for pollution rights, many subsequent contributions have analyzed how some of these ideas have been implemented into environmental policy. Although most of the success stories in that respect come from the US, there is also a (modest) European experience with (some forms of) tradable pollution rights. For instance in the Netherlands, Peeters[22] discusses in her dissertation Dutch manure legislation which allows for a trade in the right to produce manure. As far as the US is concerned, the empirical material relating to the experience with transferable permits is overwhelming. Making an arbitrary selection, one can, for example, refer to the work of Oates[23] who discussed the emissions trading system for air pollutants and

15 Dales, J., *Pollution, Property and Prices: An Essay in Policy*, Toronto, University of Toronto Press, 1968.
16 Montgomery, D.W., "Markets in Licenses and Efficient Pollution Control", *Journal of Economic Theory*, 5, 1972, 395–418.
17 Ackerman, B.A., Rose-Ackerman, S., Sawyer, J. Jr. and Henderson, D.R., *The Uncertain Search for Environmental Quality*, New York, NY, Free Press, 1974.
18 Rose-Ackerman, S., "Market Models for Water Pollution Control: their Strength and Weaknesses", *Public Policy*, 25, 1977, 383–406.
19 Noll, R., "The Feasibility of Marketable Emissions Permits in the United States", in Stewart, R.B. and Krier, J.B. (eds.), *Environmental Law and Policy*, Virginia, Charlottesville, 1982, 116–128.
20 Tietenberg, Th., *Emissions Trading: an Exercise in Reforming Pollution Policy*, Washington, DC, Resources for the Future, 1985.
21 Hahn, R.W. and Hester, G.L., "Where Did All The Markets Go? An Analysis of EPA's Emissions Trading Programme", *Yale Journal on Regulation*, 6, 1989, 109–153.
22 Peeters, M., Marktconform Milieurecht? Een Rechtsvergelijkende Studie naar de Verhandelbaarheid van Vervuilingsrechten (Market Oriented Environmental Law? A Comparative Legal Study into the Tradeability of Pollution Rights), Zwolle, Tjeenk Willink, 1992.
23 Oates, W.E., "Market Incentives for Environmental Protection: A Survey of Some Recent Developments", in Peston, M. and Quandt, R. (eds.), *Prices, Competition, and Equilibrium*, London, Philip Allen, 1986, 251–267.

pointed out that emissions trading has made real headway in certain regions. With equal enthusiasm he reports on the success of a system of transferable discharge permits in Wisconsin, noting that there are several European countries that are closely following the US experience with transferable emissions entitlements.[24] His enthusiasm is supported by other experts in the area. Hahn and Hester[25] argue that the trading programs dealing with the Clean Air Act have led to considerable savings, albeit that they have been less than anticipated. However, they also point out that it is difficult to demonstrate major environmental improvements as a consequence of these market policies. Indeed, trading may have increased emissions in some cases where the pollution rights that were sold were previously not being fully utilized by the owner.[26]

Nash and Revesz have researched the functioning of certain U.S. tradable pollution permit regimes.[27] One such example is the National Sulfur Dioxide Trading Program which is directed at controlling acid rain and functions on a nationwide level, with no geographic restrictions on trading. According to Nash and Revesz, this program is poorly designed, because it pays no attention to the location of the sulfur dioxide emission. It has for instance been allowed to sell emission rights from regions that cause limited harm to the environment to regions that contribute most to the acid rain (the upwind states) problem. The program does not therefore prevent the development of acid rain spots. To counteract this problem, the State of New York in 2000 enacted a law to prevent the sale of sulfur dioxide permits to factories in upwind states.

3.3 Environmental taxes

In this part of our paper we review the literature on the role of environmental taxes. As mentioned earlier, the case for pollution taxes has been made since the early work of Pigou. Instead of focusing on the known literature that defends the importance of taxes from an economic point of view, it is more interesting to look now at empirical results. Earlier in this paper we examined the literature that advocated for the implementation of environmental policy based on the tax system. The classical economic literature on environmental taxes in the Pigouvian tradition has recently been taken one step further by Paulus who examined the feasibility of ecological taxation, examining how the whole taxation system could be ecologically reshaped.[28]

24 See also Oates, W.E. and Collinge, R.A., "Efficiency in Pollution Control in the Short and Long Run: a System of Rental Emission Permits", *Canadian Journal of Economics*, 15(2), 1982, 346-354; Oates, W.E., Crupnik, A.J. and Van de Verg, E., "On Marketable Air Pollution Permits: the Case for a System of Pollution Offsets, *Journal of Environmental Economics and Management*, 10(3), 1983, 233-247; Oates, W.E. and McGartland, A.M., "Marketable Permits for the Prevention of Environmental Deterioration", *Journal of Environmental Economics and Management*, 12(3), 1985, 207-228 and Oates, W.E. and McGartland, A.M., "Marketable Pollution Permits and Acid Rain Externalities: a Comment and Some Further Evidence", *Canadian Journal of Economics*, 18(3), 1985, 668-675.

25 Hahn, R.W. and Hester, G.L., "Where Did All The Markets Go? An Analysis of EPA's Emissions Trading Programme", *Yale Journal on Regulation*, 6, 1989, 109-153.

26 See also Dewees, D.N., Duff, D. and Trebilcock, M.J., *Exploring the Domain of Accident Law: Taking the Facts Seriously*, Oxford, Oxford University Press, 1996, 267.

27 Nash, J.R. and Revesz, R.L., "The Design of Marketable Permit Schemes to Control Local and Regional Pollutants", www.cserge.ucl.ac.uk/Nash_and_Revesz.pdf

28 Paulus, A., *The Feasibility of Ecological Taxation*, Antwerp, Maklu, 1995.

As far as empirical material relating to experiences with taxes is concerned it is remarkable that much more evidence appears to emanate from Europe than from the United States. This was typically the reverse for the marketable pollution permits, which were apparently more popular in the American experience than in Europe. Dewees/Duff/Trebilcock[29] note that charges are rarely introduced "in the text book form". Hahn,[30] moreover, claims that most emission charges or fees are used as a revenue generating device for public services rather than instruments of environmental policy, as they were prescribed by economists. The reason why taxes are rarely used in implementing environmental policy in the United States has been discussed in a report prepared by Oates[31] for the OECD. Most empirical evidence concerning the effectiveness of environmental taxes and charges come indeed from Europe. Dewees/Duff/Trebilcock[32] argued that in the Netherlands water pollution by 14 industries responsible for 90% of total water pollution decreased by 50% between 1969 and 1975 and by another 20% by 1980, whereby half of this reduction was attributable to the effluent charge. Similar success stories come from Germany[33] where, due to water effluent charges, there were significant increases in water treatment leading most of the firms to comply with the existing emission standards. Since Germany (as most European countries) still has a combination of effluent charges and emission standards, it is, however, difficult to argue that the significant investments in water treatment plans were mainly due to the charges system and not for example to the threat of administrative and/or criminal sanctions in case of violation of emission standards. These findings concerning the success of effluent charges in Germany comply with reports by Frey who argues that the environmental taxes lead to a consolidated reduction of emissions into both the aqua system and into the air.[34] We can finally point at a study by Bongaerts/Kraemer[35] comparing water pollution charges in France, the Netherlands and the Federal Republic of Germany (Bongaerts/Kraemer, 1987), coming to the same conclusion that effluent charges provide a strong incentive to invest in water pollution abatement equipment, but that it is impossible to disentangle the separate effects of charges and emission standards. The latter effect is especially strong in Germany where the charges are halved for emitters who meet the effluent standards.

29 Dewees, D. Duff, D. and Trebilcock, M., *Exploring the Domain of Accident Law; Taking the Facts Seriously*, New York, Oxford, Oxford University Press, 1996.

30 Hahn, R.W., "Economic Prescriptions for Environmental Problems: How the Patient Followed the Doctor's Orders", *Journal of Economic Perspectives*, vol. 3, 1989, 95–114

31 Oates, W.E., "Environment and Taxation: the Case of the United States", in OECD Documents, Environment and Taxation: the Cases of the Netherlands, Sweden and the United States, Paris, OECD, 1994.

32 Dewees, D. Duff, D. and Trebilcock, M., *Exploring the Domain of Accident Law; Taking the Facts Seriously*, New York, Oxford, Oxford University Press, 1996.

33 Brown, G. and Johnson, R., "Pollution Control by Effluent Charges: It Works in the Federal Republic of Germany, why not in the US?", *Natural Resources Journal*, 1984, 929 ff.

34 Frey, B.S., *Umweltökonomie*, third edition, Göttingen, VandenHoeck & Ruprecht, 1992.

35 Bongaerts, J.C. and Kraemer, R.A., "Water Pollution Charges in Three Countries. Control Through Incentives", *European Environment Review*, vol. 1(4), 1987, 12–19.

4. ANALYSIS

Let us now try to provide an explanation for the results found in the literature in view of the fact that environmental taxes have not only been used less than what the environmental economists predicted; but also that they seem more popular in Europe than in the United States. In the United States, in contrast, emission trading systems seem to be more popular than in Europe. We will try to provide an explanation for these results by looking at public interest (A) and private interest (B) theory.

4.1 Public interest perspective

4.1.1 Choice of instruments

There is an extensive body of work that has examined the issue of the choice of a particular instrument in addressing a specific externality problem. These writings discusses the comparative benefits of various instruments in a given situation. Polinsky builds on the Calabresi/Melamed model, which discusses the optimal use of property rights and liability rules, by adding a tax-subsidy approach to this classic comparison between property rights and liability rules. Polinsky argues that where governments have complete information about the externality problem, the tax-subsidy approach is the only effective way of controlling both the externality issue and protecting both parties' entitlements. There is also the case in a positive costs transaction world. Polinsky also addresses the more realistic setting in which the government has limited information. In that case the approaches can be ranked to some extent.[36] He argues that the tax approach will be inferior to the liability approach in a wide range of circumstances, but that in terms of entitlement protection there is a clear preference for the property rights approach. Hence, a distinction is made between, common law remedies such as property rights and liability rules on the one hand, and incentive-based mechanisms such as taxes and charges on the other.

Some attention has also been paid to the problem of combining tort recovery and effluent fees or tradable rights. Rose-Ackerman has argued that incentive schemes require a fundamental rethinking of the relationship between tort law and statutory law. She points out that incentive-based regulatory statutes should pre-empt tort actions: if fee schedules have been set to reflect social costs, tort actions would be redundant or even counterproductive.[37] This goes to the fundamental point mentioned above, to the effect that a combined use of instruments is useful when there are complementary benefits of both instruments. If, on the other hand both instruments are directed at the same goal, applying two instruments may only lead to increased administrative costs or to overdeterrence.

Economists have obviously tried to show that incentive-based mechanisms are superior to traditional command and control mechanisms. The theoretical literature

36 Polinsky, A.M., "Controlling externalities and protecting entitlements: property right, liability rule and the tax-subsidy approaches", *Journal of Legal Studies*, vol. 8, 1979, 1-48. A comparison of Pigouvian taxes and the liability rule approach is also provided by Brown and Holahan (Brown, J.P. and Holahan, W.L., "Taxes and legal rules for the control of externalities when there are strategic responses", *Journal of Legal Studies*, vol. 9, 1980, 165-178).

37 See Rose-Ackerman, S., *Rethinking the progressive agenda, the reform of the American regulatory state*, New York, Free Press, 1992, 128.

pointing at the advantages of incentive-based mechanisms is overwhelming.[38] However, Oates and other co-authors indicate that the incentive-based policies are not necessarily superior to command and control approaches. This is according to them more particularly the case when command and control approaches are designed with at least an eye on cost savings.[39]

Recently Frey pointed at the importance of intrinsic motivation of citizens in the form of environmental morality. He argued that some instruments might encourage the intrinsic motivation, whereas others rather undermine it. Frey argues that an environmental policy, which is solely based on controls and commands undermines environmental morality, because it reduces the self-determination of people. Moreover, complex and abstract regulations are unlikely to improve environmental morality. The same is, however, true according to Frey for tradable emission rights. To pay for being able to undertake an undesired activity – the pollution of the environment – can be compared with the indulgences sold in the Middle Ages: the sense of punishment induced by sinning is lost as a result of the "license to pollute". Emission rights of course tend to reduce pollution because they make violation costly, but on the other hand they destroy the intrinsic motivation to safeguard the environment.

The best way to promote environmental morality in the short term is by appeals and participation procedure and in the long run by education. Moreover, when legal regulations have an expressive function, this supports environmental morality. This is the case with easily comprehensible regulations whose punishments fit exactly the damage done to nature.

Because the market-oriented policy instruments such as tradable licenses do not always support an environmental morality Frey suggests using complementary environmental policies. However, a complementary policy should not be identified with a "system's approach" in the sense that everything should be done at the same time. The aim must be to exploit the strong points of each instrument while at the same time compensating for the approaches negative aspects.[40]

Finally, concerning the choice of various instruments, we should point at the law and economics literature where a combined use of a variety of instruments such as property rights, liability rules, emission and target standards has been advocated. Once more, we should stress that such a combined use of instrument does not mean that all instruments should be used at the same time, but that the comparative benefits of every instrument should be used in a complementary approach.[41]

38 See e.g. Ackerman, B.A. and Stewart, R.B., "Reforming environmental law: the democratic case for market incentives", *Columbia Journal of Environmental Law*, vol. 13, 1988, 171-199 and Tietenberg, Th., "Economic instruments for environmental regulation", *Oxford Review of Economic Policy*, 1990, 17-33.

39 Oates, W., Portney, P. and McGartland, A., "The *net* benefits of incentive based regulation: a case study of an environmental standard setting", *American Economic Review*, 1989, vol. 79, 1233-1242.

40 Frey, B.S., "Morality and rationality in environmental policy", *Journal of Consumer Policy*, Vol. 22, 1999, 395-417 and Frey, B.S., *Not just for the money. An economic theory of personal motivation*, Cheltenham, Edward Elgar, 1997, 56-79.

41 See Hansson, I. and Skogh, G., "Moral hazard and safety regulation", *The Geneva Papers on Risk and Insurance*, Vol. 12, 1987, 132-144; Skogh, G., "Public insurance and accident prevention", *International Review of Law and Economics*, vol. 2, 1982, 67-80; Skogh, G., "The combination of private and public regulation of safety" in Faure, M. and Van den Bergh, R. (eds.), *Essays in law and economics. Corporations, accident prevention and compensation for losses*, Antwerp, Maklu, 1989, 87-101; Gravelle, H.S.E., "Accidents, taxes, liability rules and insurances", *Geneva Papers on Risk and Insurance*, vol. 12, 1987, 115-131 and see more particularly Gunningham, M. and Grabosky, P., *Smart regulation. Designing environmental policy*, Oxford, Clarendon Press, 1998.

4.2 Interest group perspective

4.2.1 Lobby for barriers to entry or lenient standards

Up to now we have assumed that governmental regulation is always made "in the public interest". Thus, the government always enacts regulation to increase social welfare and to raise efficiency. This implies that the government would pass a regulation only if it was considered to be efficient. The reality is often different. Looking at legislation one can often see regulation of activities for which such a method of control seems inefficient; in other cases there is a proper argument for regulation, but the formulation of the regulation is inefficient.

Economists of the "public choice" school have studied the phenomenon of regulation and have examined the reasons why some are inefficient.[42] In this public choice approach, micro-economic models have been used to explain processes of regulation. A starting point is the assumption that politicians like ourselves *homo economicus*, who have preferences for the introduction of regulation that will benefit interest groups that support them. From this point of view the politician is no longer someone who is serving the public interest, but a utility maximizer serving his own interests.

The starting point of the public choice analysis is that regulation is considered as the product of supply and demand on a political market. On the demand side we find the various interest groups who demand favorable regulation and on the supply side, the wealth maximizing politicians who wish to favor interest groups, which provide them political support. The product is environmental legislation protecting an interest group in exchange for political support. Thus a wealth transfer (a so-called rent) can be transferred to the interest group protected. This rent-seeking behavior will, according to the literature, be particularly successful if the transaction costs for the group in bringing together individuals to defend a common interest are relatively small and if the information costs incurred by the public at large to find out the rent-seeking are relatively high. These conditions for rent seeking may often be met in case of environmental regulation. The fact that a transfer to an interest group has taken place will often be disguised by arguing that environmental protection or victim protection is provided by the particular piece of legislation. Transaction costs are often low if only a few firms come together to defend a common interest.

Indeed, the reason why this wealth transfer to interest groups takes place can be found in these two well-known economic phenomena of information costs and transaction costs.

The *information* costs are those incurred by the public at large in finding out the effect of the regulation. Because the wealth transferred to an interest group is derived from the general public, one individual will usually not realize that such a transfer to an interest group has taken place. Moreover, most interest group legislation is claimed to protect the general public. This is often the case with regulation which is supposed

42 See in general: Buchanan, J. and Tullock, G., *The calculus of consent*, University of Michigan Press, 1962; Buchanan, J., Tollison, R. and Tullock, G., (eds.), *Toward a theory of the rent seeking society*, University of Michigan Press, 1962.

to protect consumers (and which often only protects the retailing trade)[43] or regulation, which is supposed to protect victims (and which often only protects the interests of insurers of certain industries).[44]

Transaction costs are those incurred by a group in bringing individuals together to defend a common interest. Only a group which is relatively small, well organized and single issue oriented, will have low transaction costs and will be able to benefit from wealth transfers through regulation.[45]

There is a lot of literature providing theoretical support for the rent-seeking argument in case of environmental regulation, and empirical evidence as well. The starting point for environmental regulation is often the political will to provide some action of environmental protection. Keenan/Rubin would argue that this demand for regulation, which is not represented by a well-defined and active particular interest group, may be initiated by a so-called shadow interest group.[46] This is a group that would have members and come into being if an accident occurred. Potential victims of environmental pollution can thus be seen as members of this latent group. If a shadow interest group ceases to be a shadow group and becomes active, it will have all the characteristics of a normal interest group. Knowing that shadow interest groups have the potential to become an effective lobby, rational politicians will, under certain circumstances, respond to these groups in the same way that they will respond to normal interest groups, even though the shadow groups have not yet organized.

If under these circumstances legislative intervention seems unavoidable the theory of regulation suggests that under these circumstances the interest groups involved will accept a general principle of regulation, but may strive to change its scope.[47] The industrial interest groups to whom the environmental regulation will be applied, may realize that regulation may enhance producer wealth while it simultaneously corrects, or at least reduces, an externality problem. This outcome has been stressed by Maloney and McCormick with respect to environmental quality regulation. They argue that the industry, realizing that environmental regulation is unavoidable, will co-operate in the development of the regulation and try to change the contents to its advantage. A classic example is the introduction of so-called "grandfather clauses" which stipulate that the regulation will not be applicable to firms or products, which are already in existence. Hence, the regulation can create a new barrier for market entry and so protect the existing industrial practices and

43 This has been proven with respect to Sunday closing regulation and "unfair trade practices" statutes. See Van den Bergh, R., "Belgian public policy towards the retailing trade", in Graf von den Schulenburg, J.M. and Skogh, G. (eds.), *Law and Economics and the Economics of Legal Regulation*, Dordrecht, Nijhoff, 1986, 185–205. See also the article of Jaffer, S., and Kay, J., "The regulation of Shop Opening Hours in the United Kingdom", in Graf von den Schulenburg, J.M. and Skogh, G. (eds.), *Law and Economics and the Economics of Legal Regulation*, Dordrecht, Nijhoff, 1986, 169–183.

44 This has been proven with respect to legislation concerning the liability for nuclear accidents. See Faure, M. and Van den Bergh, R., "Liability for nuclear accidents in Belgium from an interest group perspective", in *International Review of Law and Economics*, 1990, 10, 241–254.

45 See Olson, M., *The rise and decline of nations*, 1982, 26–27; Posner, R., "Theories of economic regulation", *Bell Journal of economics*, 1974, 345; McCormick, R. and Tollison, R., *Politicians, Legislation and the economy: an inquiry into the interest group theory of governments*, 1982, 17.

46 Keenan, D. and Rubin, P. (1988), "Shadow Interest Groups and Safety Regulation", *International Review of Law and Economics*, 21–36.

47 Pelzman, S., "Toward a more General Theory of Regulation", *Journal of Law and Economics*, vol. 19, 1976, 211–240.

products.[48] In other cases, e.g. as far as standard setting is concerned, industry may lobby for lenient environmental standards to increase their own profits.

As indicated above, the efforts of industry may go in various directions: sometimes regulation will be used by using grandfather clauses to limit market entry;[49] in other cases there will be lobbying for more lenient environmental standards. With respect to the first type of lobbying we can refer also to the function of licenses, which are considered a central instrument in environmental policy. Moore (1961)[50] pointed at the anti-competitive effects of licensing.[51]

Evidence of rent seeking behavior in environmental regulation in the United States was recently reported by Adler[52] and similar cases can be found in Europe as well.[53]

The lobby for lenient standards may take place with the legislator. But since legislators usually delegate the standard setting power to administrative agencies, this type of lobbying, e.g. to obtain favourable emission standards for an individual firm, will usually take place with the administrative agency. The behavior of bureaucracies in response to lobbying by industry is analyzed in different papers, e.g. by Downing.[54] Rent-seeking will obviously not only take place as far as the standard setting process is concerned, but can also play a role in case of zoning.[55]

4.2.2 Influence of private interest on instrument choice

The influence of private interest in environmental law has been addressed specifically in the literature with respect to the issue of instrument choice. In this paper, we have examined the range of instruments that can be used to control environmental pollution, indicating that the literature suggests under what kind of conditions that a particular type of policy instrument would be optimal. In practice these "economic prescriptions"[56] are not always followed. One reason why e.g. in the United States emission taxes are seldom used and policy still relies to a large extent on the command and control approach is that firms will prefer emission standards to taxes,

48 Dewees, D.N., "Instrument Choice in Environmental Policy", *Economic Inquiry*, vol. 21, 1983, 53-71.

49 Maloney, M.T. and McCormick, R.E., "A Positive Theory of Environmental Quality Regulation", *Journal of Law and Economics*, 1982, 99-123.

50 Moore, T.P., "The Purpose of Licensing", *Journal of Law and Economics*, 1961, 93-117.

51 See on the use of standards to seek competitive advantages also Ogus, A.I., "Standard Setting for Environmental Protection: Principles and Processes", in Faure, M., Vervaele, J. and Weale, A. (eds.), *Environmental Standard in the European Union in an Interdisciplinary Framework*, Antwerp, MAKLU, 1994, 23-37; Hahn, R.W., "Regulatory Constraints on Environmental Markets", *Journal of Public Economics*, vol. 42, 1990, 149-175; Hahn, R.W., "The Political Economy of Environmental Regulation: Towards a Unifying Framework", *Public Choice*, vol. 65, 1990, 21-47 and Huber, P. "The old-new Division in Risk Regulation", *Virginia Law Review*, vol. 63, 1983, 1025.

52 Adler, J.H, "Rent Seeking Behind the Green Curtain", *Regulation*, 1996, 26-34.

53 Faure, M. and Van den Bergh, R., "Compulsory Insurance for Professional Liability", *The Geneva Papers on Risk and Insurance*, 1989, 308-330 or Faure, M. and Van den Bergh, R., *Objectieve Aansprakelijkheid, Verplichte Verzekering en Veiligheidsregulering*, Antwerpen, MAKLU, 1989.

54 Downing, P.B., "A Political Economy Model of Implementing Pollution Laws", *Journal of Environmental Economics and Management*, vol. 8, 1989, 255-271.

55 Ault, R.W. and Ekelund, R.B., "Rent Seeking In A Static Model of Zoning", *American Real Estate and Urban Economics Association Journal*, vol. 16, 1988, 69-76; Fischel, W.A., "Externalities and Zoning", *Public Choice*, vol. 35, 1980, 37-43 and Fischel, W.A., *The Economics of Zoning Laws: A Property Rights Approach to American Land Use Controls*, The John Hopkins University Press, 1985.

56 Hahn, R.W., "A New Approach to the Design of Regulation in the Presence of Multiple Objectives", *Journal of Environmental Economics and Management*, vol. 17, 1989, 195-211 and Hahn, R.W., *A Primer on Environmental Policy Design*, New York, Harwood Academic, 1989, 135.

because standards serve as barrier to entry to new firms, thus raising the profits of existing firms. Charges on the other hand do not preclude entry by new firms and represent an additional cost to the existing firms on the market.[57] This basic point made by Buchanan/Tullock has been extended by other scholars who have examined the implication of rent seeking for pollution taxation.[58] The influence of lobbying on instrument choice has also been analyzed in the many papers by Hahn,[59] Hahn/Noll,[60] Körber[61] and by De Grauwe.[62] Hahn points out that the policy instruments are almost never used in the way that is suggested by economic theory. Emission charges are, e.g., used as a revenue raising device with few direct effects on polluters and many marketable permit approaches are not really designed to create markets. Through grandfathering the rights of existing firms are often protected. In addition, even if the economic prescriptions (marketable pollution rights) are followed, there is some evidence that emissions trading systems have been used as a loophole by which industry could forestall compliance.[63] Hahn also argues that the varying interest group attitudes in e.g. the United States and Europe may account for the fact that European countries tend to rely more on the use of fees, whereas marketable permits have been widely used in the United States.[64] Hence, the selection of an appropriate mix of policy instruments will to a large extent be determined by the way political choices are actually made in different countries.

5. CONCLUDING REMARKS

In this paper, we cursorially examined environmental taxes by comparing them to other instruments that could be used to control environmental pollution. The idea behind this attempt to address the issue of taxes by putting them in a broader perspective is that we believe that in practice taxes are rarely the sole instrument to control environmental pollution. In practice, it is apparent that a whole range of policy instruments are used from traditional "command and control" to more

57 Buchanan, J. and Tullock, G., "Polluters' Profits and Political Response: Direct Controls versus Taxes", *American Economic Review*, vol. 65, 1975, 139-147 and see the comments by Coelho, Ph.R.P., "Polluters' Profits and Political Response: Direct Control versus Taxes: Comment", *American Economic Review*, vol. 66, 1976, 976-978 and Yohe, G., "Polluters' Profits and Political Response: Direct Control versus Taxes: Comment', *American Economic Review*, vol. 66, 1976, 981-982.

58 Lee, D.R., "Rent-Seeking and its Implications for Pollution Taxation", *Southern Economic Journal*, 1985, 731-744 and Brooks, M.A. and Heijdra, B.J., "Rent-Seeking and Pollution Taxation: An Extension", *Southern Economic Journal*, 1987, 335-342.

59 Hahn, R.W., "Economic Prescriptions for Environmental Problems: How the Patient Followed the Doctor's Orders", *Journal of Economic Perspectives*, vol. 3, 1989, 95-114; Hahn, R.W., "A New Approach to the Design of Regulation in the Presence of Multiple Objectives", *Journal of Environmental Economics and Management*, vol. 17, 1989, 195-211, Hahn, R.W., *A Primer on Environmental Policy Design*, New York, Harwood Academic, 1989, 135.

60 Hahn, R.W. and Noll, R., "Barriers to Implementing Tradeable Air Pollution Permits: Problems of Regulatory Interaction", *Yale Journal on Regulation*, vol. 1, 1983, 63-91.

61 Körber, A., "Standards and Taxes in Environmental Law from a Public Choice Perspective", in Bouckaert, B. and De Geest, G. (eds.), *Essays in Law and Economics II*, Antwerp, MAKLU, 1995, 161-191.

62 De Grauwe, P., "Political Economy of the Choice of Environmental Policy Instruments in the EC", in Abraham, F., Deketelaere, K. and Stuyck, J. (eds.), *Recent Economic Legal Developments in European Environmental Policy*, Leuven, Leuven University Press, 1995, 111-168.

63 Hahn, R.W. and Hester, G.L., "Where Did All The Markets Go? An Analysis of EPA's Emissions Trading Programme", *Yale Journal on Regulation*, vol. 6, 1989, 109-153.

64 Hahn, *op.cit.*, 1989, 111.

economic instruments and even environmental liability. In this paper, we compare two commonly used – tradable permits and environmental taxes. The rationale for the comparison was that these instruments were prescribed by economists in the literature device as the alternatives to the traditional command and control approaches which they considered an inefficient device. We discussed the traditional argument in favor of tradable permits and taxes to the effect that both are good in providing optimal incentives for environmental pollution in a flexible manner. Command and control type approaches on the other hand relied heavily on optimal information with agencies and may hence lead to inefficient standard setting or provide too little incentives for additional pollution abatement, that is to say additional to what the regulatory standard requires.

We therefore first compared (in § 2) environmental taxes with the other instrument, heavily relied on by economists, tradable permits.

In addition, we put the comparison between taxes and other instruments in a broader perspective in § 3 by discussing the literature on the choice of instruments, arguing that recent literature has moved away from the traditional idea that Pigouvian taxes would be the optimal solution to control externalities. Law and economic scholars now seem to prefer an optimal mix of various instruments, whereby the academic literature now focuses on the finding of this optimal mix.

When looking at empirical evidence of the use of various instruments it is striking to observe that environmental taxes seem to be far more popular in Europe than in the United States, whereas the United States relies to a much greater extent on tradable permits. The apparent popularity of one environmental instrument over the other can partially be explained from a public interest perspective. In this respect, Frey provides a powerful argument on why environmental taxes might not be the optimal instrument to control externalities. Frey argues that they may have a negative effect on environmental morality. However, Frey argues that the same is true with tradable emission rights. Both instruments would not have a positive effect on the intrinsic motivation to safeguard the environment. This theory, therefore, may explain why policy makers still rely more heavily on traditional command and control instruments (provided that there is a high degree of public participation) than on so-called economic instruments. It does, however, not explain why environmental taxes are used to a much lesser extent in the United States than in Europe. Private interest theory, as propounded by the public choice school, attempts to explain these differences. It relies on the classic argument presented by Buchanan/Tullock that industry probably prefers command and control legislation because this type of regulation (especially the licenses) can be used to create barriers to entry. Indeed the practical effects of a licensing regime is that it makes more difficult for new entrants to enter the market, and thereby increases profits for existing firms. Taxes, on the other hand, will only increase costs for industry (provided that they are applied equally to all firms in the market) without this capacity of creating barriers to new entrants. Tradable emission rights may have this advantage, depending on what allocation mechanism is chosen. If a so-called grandfathering mechanism is chosen to allocate tradable emission rights, one can again understand that (American) firms that were already in the market would be more enthusiastic for tradable emission rights than for taxes. This would of course be different if another allocation mechanism for the tradable permits were to be used, for instance auctioning. Auctioning obviously

does not have the same effect of protecting existing firms as is the case with grandfathering.

It is still not entirely clear why American industries have been successful in obstructing the implementation of environmental charges to a much greater extent than their European counterparts. Public choice theory would predict that American industry is probably more powerful and effective in lobbying; on the other hand it may also have to do with the preferences of the public at large in Europe. Perhaps in Europe there a stronger countervailing force from (green) non-governmental organisations, which explains the greater successes of industrial lobbying in the United States.

This paper was merely a first attempt to show that it seems interesting to look at the usefulness of environmental taxes in a broader context, by comparing them with other environmental policy instruments. Moreover, it seems equally interesting to use public interest and private interest economic theories to try to provide explanations for differing uses of environmental taxes in differing legal systems. However, we could merely indicate within the scope of this paper that it seems important to examine environmental taxes within this broader framework of the search for the optimal mix of environmental policy instruments. Final answers on the optimal role of taxes in this respect can of course only be provided if far more empirical work in this respect has been undertaken.

REFERENCES

Abelson, P., *Cost Benefit Analysis and Environmental Problems*, Farnborough, Saxon House, England, 1979.

Ackerman, B.A., Rose-Ackerman, S., Sawyer, J. Jr. and Henderson, D.R., *The Uncertain Search for Environmental Quality*, New York, NY Free Press, 1974.

Ackerman, B.A. and Stewart, R.B., "Reforming environmental law: the democratic case for market incentives", *Columbia Journal of Environmental Law*, vol. 13, 1988, 171–199.

Adler, J.H, "Rent Seeking Behind the Green Curtain", *Regulation*, 1996, 26– 34.

Ault, R.W. and Ekelund, R.B., "Rent Seeking In A Static Model of Zoning", *American Real Estate and Urban Economics Association Journal*, vol. 16, 1988, 69–76.

Baumol, W.J. and Oates, W.E., "The use of standards and prices for protection of the environment", *Swedish Journal of Economics*, vol. 73, 1971, 42–54.

Bongaerts, J.C. and Kraemer, R.A., "Water Pollution Charges in Three Countries. Control Through Incentives", *European Environment Review*, vol. 1(4), 1987, 12–19.

Brooks, M.A. and Heijdra, B.J., "Rent-Seeking and Pollution Taxation: An Extension", *Southern Economic Journal*, 1987, 335–342.

Brown, G. and Johnson, R., "Pollution Control by Effluent Charges: It Works in the Federal Republic of Germany, why not in the US?", *Natural Resources Journal*, 1984, 929 ff.

Brown, J.P. and Holahan, W.L., "Taxes and legal rules for the control of externalities when there are strategic responses", *Journal of Legal Studies*, vol. 9, 1980, 165–178.

Buchanan, J., Tollison, R. and Tullock, G., (eds.), *Toward a theory of the rent seeking society*, University of Michigan Press, 1962.

Buchanan, J. and Tullock, G., *The calculus of consent*, University of Michigan Press, 1962.

Buchanan, J. and Tullock, G., "Polluters' Profits and Political Response: Direct Control versus Taxes", *American Economic Review*, vol. 65, 1975, 139–147.

Cocker, A. and Richards C., *Valuing the Environment, Economic Approaches to Environmental Evaluation*, London, Bellhaven Press, 1992.

Coelho, Ph.R.P., "Polluters' Profits and Political Response: Direct Control versus Taxes: Comment", *American Economic Review*, vol. 66, 1976, 976–978.

Dales, J., *Pollution, Property and Prices: An Essay in Policy*, Toronto, University of Toronto Press, 1968.

De Grauwe, P., "Political Economy of the Choice of Environmental Policy Instruments in the EC", in Abraham, F., Deketelaere, K. and Stuyck, J. (eds.), *Recent Economic Legal Developments in European Environmental Policy*, Leuvn, Leuven University Press, 1995, 111–168.

Dewees, D.N., "Instrument Choice in Environmental Policy", *Economic Inquiry*, vol. 21, 1983, 53–71.

Dewees, D. Duff, D. and Trebilcock, M., *Exploring the Domain of Accident Law; Taking the Facts Seriously*, New York, Oxford, Oxford University Press, 1996.

Downing, P.B., "A Political Economy Model of Implementing Pollution Laws", *Journal of Environmental Economics and Management*, vol. 8, 1989, 255–271.

Faure, M. and Van den Bergh, R., "Compulsory Insurance for Professional Liability", *The Geneva Papers on Risk and Insurance*, 1989, 308–330.

Faure, M. and Van den Bergh, R., *Objectieve Aansprakelijkheid, Verplichte Verzekering en Veiligheidsregulering*, Antwerpen, MAKLU, 1989.

Faure, M. and Van den Bergh, R., "Liability for nuclear accidents in Belgium from an interest group perspective", in *International Review of Law and Economics*, 1990, 10, 241–254.

Field, B.C., *Environmental Economics: an Introduction*, McGraw-Hill, New York, 1994.

Fischel, W.A., "Externalities and Zoning", *Public Choice*, vol. 35, 1980, 37–43.

Fischel, W.A., *The Economics of Zoning Laws: A Property Rights Approach to American Land Use Controls*, The John Hopkins University Press, 1985.

Frey, B.S., *Umweltökonomie*, 3rd edn, Göttingen, VandenHoeck & Ruprecht, 1992.

Frey, B.S., *Not just for the money. An economic theory of personal motivation*, Cheltenham, Edward Elgar, 1997, 56–79.

Frey, B.S., "Morality and rationality in environmental policy", *Journal of Consumer Policy*, Vol. 22, 1999, 395–417.

Gravelle, H.S.E., "Accidents, taxes, liability rules and insurances", *Geneva Papers on Risk and Insurance*, vol. 12, 1987, 115–131.

Gunningham, M. and Grabosky, P., *Smart regulation. Designing environmental policy*, Oxford, Clarendon Press, 1998.

Hahn, R.W. and Noll, R., "Barriers to Implementing Tradeable Air Pollution Permits: Problems of Regulatory Interaction", *Yale Journal on Regulation*, vol. 1, 1983, 63–91.

Hahn, R.W., "A New Approach to the Design of Regulation in the Presence of Multiple Objectives", *Journal of Environmental Economics and Management*, vol. 17, 1989, 195–211.

Hahn, R.W. and Hester, G.L., "Where Did All The Markets Go? An Analysis of EPA's Emissions Trading Programme", *Yale Journal on Regulation*, 6, 1989, 109–153.

Hahn, R.W., "Economic Prescriptions for Environmental Problems: How the Patient Followed the Doctor's Orders", *Journal of Economic Perspectives*, vol. 3, 1989, 95-114.

Hahn, R.W., *A Primer on Environmental Policy Design*, New York, Harwood Academic, 1989.

Hahn, R.W., "Regulatory Constraints on Environmental Markets", *Journal of Public Economics*, vol. 42, 1990, 149-175.

Hahn, R.W., "The Political Economy of Environmental Regulation: Towards a Unifying Framework", *Public Choice*, vol. 65, 1990, 21-47.

Hansson, I. and Skogh, G., "Moral hazard and safety regulation", *The Geneva Papers on Risk and Insurance*, Vol. 12, 1987, 132-144.

Huber, P. "The old-new Division in Risk Regulation", *Virginia Law Review*, vol. 63, 1983, 1025.

Jaffer, S., and Kay, J., "The regulation of Shop Opening Hours in the United Kingdom", in Graf von den Schulenburg, J.M. and Skogh, G. (eds.), *Law and Economics and the Economics of Legal Regulation*, Dordrecht, Nijhoff, 1986, 169-183.

Kaplow, L. and Shavell, S., "On the superiority of Corrective Taxes to Quantity Regulation", American Law and Economics Review, 4 (1), 2002, 1-17.

Keenan, D. and Rubin, P. (1988), "Shadow Interest Groups and Safety Regulation", *International Review of Law and Economics*, 21-36.

Körber, A., "Standards and Taxes in Environmental Law from a Public Choice Perspective", in Bouckaert, B. and De Geest, G. (eds.), *Essays in Law and Economics II*, Antwerp, MAKLU, 1995, 161-191.

Lee, D.R., "Rent-Seeking and its Implications for Pollution Taxation", *Southern Economic Journal*, 1985, 731-744.

Maloney, M.T. and McCormick, R.E., "A Positive Theory of Environmental Quality Regulation", *Journal of Law and Economics*, 1982, 99-123.

McCormick, R. and Tollion, R., *Politicians, Legislation and the economy: an inquiry into the interest group theory of governments*, 1982.

Mishan, E.J., Cost-Benefit Analysis: an Informal Introduction, 2nd Edn, 1974.

Montgomery, D.W., "Markets in Licenses and Efficient Pollution Control", *Journal of Economic Theory*, 5, 1972, 395-418.

Moore, T.P., "The Purpose of Licensing", *Journal of Law and Economics*, 1961, 93-117.

Nash, J.R. and Revesz, R.L., "The Design of Marketable Permit Schemes to Control Local and Regional Pollutants", www.cserge.ucl.ac.uk/Nash_and_Revesz.pdf

Noll, R., "The Feasibility of Marketable Emissions Permits in the United States", in Stewart, R.B. and Krier, J.B. (eds.), *Environmental Law and Policy*, Virginia, Charlottesville, 1982, 116-128.

Oates, W., "Book review The Uncertain Search for Environmental Quality", *University of Pennsylvania Law Review*, vol. 124, 1976, 864-891.

Oates, W.E. and Collinge, R.A., "Efficiency in Pollution Control in the Short and Long Run: a System of Rental Emission Permits", *Canadian Journal of Economics*, 15(2), 1982, 346-354.

Oates, W.E., Crupnik, A.J. and Van de Verg, E., "On Marketable Air Pollution Permits: the Case for a System of Pollution Offsets, *Journal of Environmental Economics and Management*, 10(3), 1983, 233-247.

Oates, W.E. and McGartland, A.M., "Marketable Pollution Permits and Acid Rain Externalities: a Comment and Some Further Evidence", *Canadian Journal of Economics*, 18(3), 1985, 668-675.

Oates, W.E. and McGartland, A.M., "Marketable Permits for the Prevention of Environmental Deterioration", *Journal of Environmental Economics and Management*, 12(3), 1985, 207-228.

Oates, W.E., "Market Incentives for Environmental Protection: A Survey of Some Recent Developments", in Peston, M. and Quandt, R. (eds.), *Prices, Competition, and Equilibrium*, London, Philip Allen, 1986, 251-267.

Oates, W., Portney, P. and McGartland, A., "The *Net* Benefits of Incentive-based Regulation: A Case Study of Environmental Standard Setting", *American Economic Review*, vol. 79, 1989, 1233-1242.

Oates, W.E., "Environment and Taxation: the Case of the United States", in *OECD Documents, Environment and Taxation: the Cases of the Netherlands, Sweden and the United States*, Paris, OECD, 1994.

Ogus, A.I., "Standard Setting for Environmental Protection: Principles and Processes", in Faure, M., Vervaele, J. and Weale, A. (eds.), *Environmental Standard in the European Union in an Interdisciplinary Framework*, Antwerp, MAKLU, 1994, 23-37

Olson, M., *The rise and decline of nations*, 1982.

Paulus, A., *The Feasibility of Ecological Taxation*, Antwerp, Maklu, 1995.

Peeters, M., Marktconform Milieurecht? Een Rechtsvergelijkende Studie naar de Verhandelbaarheid van Vervuilingsrechten (Market Oriented Environmental Law? A Comparative Legal Study into the Tradeability of Pollution Rights), Zwolle, Tjeenk Willink, 1992.

Pelzman, S., "Toward a more General Theory of Regulation", *Journal of Law and Economics*, vol. 19, 1976, 211-240.

Polinsky, A.M., "Controlling externalities and protecting entitlements: property right, liability rule and the tax-subsidy approaches", *Journal of Legal Studies*, vol. 8, 1979, 1-48.

Posner, R., "Theories of economic regulation", *Bell Journal of Economics*, 1974, 345.

Rosen, H. S., *Public Finance*, Chicago, Irwin, 1999.

Rose-Ackerman, S., "Market Models for Water Pollution Control: their Strength and Weaknesses", *Public Policy*, 25, 1977, 383-406.

Rose-Ackerman, S., *Rethinking the progressive agenda, the reform of the American regulatory state*, New York, Free Press, 1992.

Skogh, G., "Public insurance and accident prevention", *International Review of Law and Economics*, vol. 2, 1982, 67-80.

Skogh, G., "The combination of private and public regulation of safety" in Faure, M. and Van den Bergh, R. (eds.), *Essays in law and economics. Corporations, accident prevention and compensation for losses*, Antwerp, Maklu, 1989, 87-101.

Tietenberg, Th., *Emissions Trading: an Exercise in Reforming Pollution Policy*, Washington, DC, Resources for the Future, 1985.

Tietenberg, Th., "Economic instruments for environmental regulation", *Oxford Review of Economic Policy*, 1990, 17-33.

Tolley, G.S., Graves, P.H.F. and Blomquist, G.C., *Environmental Policy, Elements of Environmental Analysis*, vol. I, Cambridge, Balliner Publishing Company, 1981.

Van den Bergh, R., "Belgian public policy towards the retailing trade", in Graf von den Schulenburg, J.M. and Skogh, G. (eds.), *Law and Economics and the Economics of Legal Regulation*, Dordrecht, Nijhoff, 1986, 185-205.

Yohe, G., "Polluters' Profits and Political Response: Direct Control versus Taxes: Comment", *American Economic Review*, vol. 66, 1976, 981-982.